SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1455.—Vol. XXXIII.] LONDON, SATURDAY, JULY 11, 1863. [WITH JOURNAL] STAMPED.... SIXPENCE. UNSTAMPED. FIVEPENCE.

ON THE LIBERATION AND DRAINAGE OF GASES FROM COAL MINES.

At the Manchester Geological Society meeting, Mr. Joseph Dickinson, the President, in the chair (a report of the proceedings of which appeared in last week's Journal), the following paper was read by Mr. Joseph Goodwin, M.E., of the Hyde and Haughton Collieries, near Manchester:—

The subject under consideration is one of considerable importance to all connected with the working of coal mines, but more particularly so to those who have to meet the dangers consequent upon earning a livelihood even in the best regulated collieries. It is, therefore, of importance that all the facts bearing upon the subject of the liberation or drainage of gases from coal mines should be given due publicity to. More especially so if they are of a nature calculated to render accidents in mines less numerous. This is my apology for bringing the subject before you in its present form. The gases that are usually met with in coal mines are carbonic acid and light carburetted hydrogen, which are, perhaps, better known to the collier by the names of black or choke-damp and fire-damp. Occasionally carbonic oxide, sulphuretted hydrogen, and other gases are met with in such forms as to clearly point out the importance of considering no place in a colliery either healthy or safe without it be thoroughly ventilated. What has been the precise circumstances under which the light carburetted hydrogen of our coal mines has been formed, must to some extent be a matter of conjecture; but yet I think it will be admitted that it has been formed by the slow decomposition of the vegetable matter that has formed our coal seams. The causes which operate in producing the other gases that are met with in coal mines are numerous. For instance, we have the decomposition of coal *in situ*, as well as the decomposition of iron pyrites and other minerals, which are left in the goafs or old workings. The rapid decay of timber and other substances, owing to the humid and moist state of the atmosphere, is also a fruitful source of deleterious gases. We have also the gases formed by the breathing of men and animals, the combustion of lights, the blasting of coal by powder, and other causes which operate in rendering the atmosphere of the mine impure. It is hardly necessary to remark that the light carburetted hydrogen is by far the most dangerous gas that we meet with in working collieries, as well as the most abundant. The circumstances under which this gas is given off from colliery workings vary to some extent. Sometimes it proceeds more freely from the roof of the mine than the floor, and *vice versa*, but in either case it is also given off from the coal seam. Carbonic acid gas, although so frequently found in collieries, does not appear to be given off from the coal itself. I have only seen two cases supporting the theory that it emanates from such a source; yet I have been endeavouring to satisfy myself upon this point for many years. One of the cases referred to was in close proximity to a fault, and in the other it was just possible that the gas might have come from some other source than that of the coal.

The remaining gases that have been mentioned, although occasionally found in coal mines, have not yet been proved to emanate from the coal. It may not be deemed out of place if I refer to a case that has recently come under my notice where carbonic oxide, or white-damp, has been found in the workings of a colliery. In the case referred to a level was being driven, which came in contact with a dirt-hole that had been driven and filled with dirt many years previous, out of which a considerable quantity of gas escaped, which did not at all affect the burning of the candle, yet produced such an effect upon the men as to render it impossible for them to stop in the place more than a few minutes at a time. It continued to escape from the dirt-hole for several days, but gradually diminished in quantity. As previously remarked, the circumstances under which gases are liberated or drained from coal seams vary considerably. It would, therefore, be vain to attempt to lay down a rule by which to judge of the distance that a coal seam can be affected by the drainage of gases, by working out an upper or under seam. But, if the distance cannot be accurately determined, we may, by collecting all the information in our power, and carefully recording all the facts that come under our own observation, arrive at an approximate idea, and thus tend to check any wild or random statements that may happen to be made upon the subject. I can conceive that gases may be liberated, or drained, from coal *in situ* by working an under seam, the falls of roof in which reach up to an upper seam; or by working out an upper seam, separated by only a few feet of strata from an under one, in which carburetted hydrogen exists under great pressure, or that in opening out a maiden field, the exploring drifts may drain the drifts that follow them. But I cannot conceive how it is possible for a mine to be drained of carburetted hydrogen by working another seam at a distance of 30 yards, or anything approaching it; yet I believe it to be the opinion of some that the drainage of gases has affected mines at a much greater distance than that named. Several cases have, however, come under my own observation where coal seams have been worked at distances varying from 4 ft. to 14 yards, and upwards, without producing any such effect. Perhaps I cannot do better than cite a few well-authenticated facts bearing upon the subject of the drainage of gases. The first case that I shall refer to is one that occurred at Clayton Colliery on April 14 last. Some time previous to that date we commenced driving a brow in the Four-feet mine, for the purpose of pumping the water up, on the one side of which was the engine-brow, at a distance of 26 feet, and on the other side the return air-course, at a distance of 10 feet; besides which levels had been driven at right-angles to the brows, at a distance of 12 yards from each other. In driving the brow referred to we found that a considerable quantity of carburetted hydrogen was given off from the coal almost the whole length of the brow; and on the morning previously named more than 30 cubic yards of space was filled with explosive gas in less than an hour. The engine-brow, return air-course, and levels have been driven more than 10 years, and, therefore, the gas had had length of time enough to have drained from the coal, if it would have drained at all. The place was perfectly free from any fault, and the coal of such a character as to impress anyone with the idea that everything was favourable to the process of drainage. The thickness of strata, or depth from the surface at the point referred to, is over 300 yards.

In the Peacock Mine, at the Hyde Colliery, two levels had been driven for many years, and were being worked back towards the shaft, when the roof of one of the works fell, and rendered it necessary to cut up within a foot or 15 in. of the old working face, in order to regain it. In so doing a considerable quantity of gas was given off from the coal, although on the one side was a thrill, or cross-cut, at the distance of three yards; and on the other side, as previously stated, not more than 15 in. of coal to where a current of air was passing, the distance between the levels in this case was from 11 to 12 yards. A still more striking case occurred at the same colliery in driving a pair of brows in the Black Mine, at a depth from 300 to 400 yards from surface. The brows were being driven up from the main level and intake air-course, and had been driven some two or three yards each in the bottom coal when a drill hole was made in the top part of the coal for the purpose of inserting a plug, to which to attach the sights by which the brow was to be kept in its proper direction. The drill hole was not more than 8 in. in depth, yet it liberated such a quantity of gas that it was with difficulty extinguished after it became ignited. The thickness of the bottom coal was about 2 ft. 9 in., and the top about 2 ft. 1 in., separated by a shaly parting of not more than an eighth-part of an inch in thickness. The level out of which the brows were driven had been opened for nearly three years, as well as a parallel level at 10 yards above it. In this case it is clear that the drainage had not extended to 9 in. For the following information I am indebted to my friend, Mr. Horsfall, of the Fairbottom Colliery, near Ashton-under-Lyne. He says—"In our black mine, at the Broad Oak Pit, we have a rank of coal 120 yards in length and 10 yards in breadth. At the top side of the pillar it is all old works, but they are thoroughly ventilated. At certain distances we make cut-throughs, and when driving these we experience the greatest difficulty from the time we have cut two or three feet up brow, in consequence of the gas that is given from off from the coal. The pillars above the rank referred to have been worked out a considerable number of years, consequently I think the gas has had every opportunity of being drained in that length of time, if there had been any possibility of such a thing." At the same pit, in driving through a pillar of coal only 5 ft. in width, considerable quantities of gas were given off from the coal. At the Heys Colliery, belonging to the same firm, two mines are being worked at a distance of 14 yards from each other; in the bottom seam they are, and have been, getting pillars, or working back the coal, for some time. In the upper one narrow work is being driven previous to removing the pillars, or commencing "robbing." Yet the upper mine gives off a great quantity of light carburetted hydrogen gas. The foregoing are not the only cases that I could cite tending to show that the distance that gases will drain from a coal seam under ordinary circumstances is very limited indeed. But I think enough has been said to point out the importance of considering no place in a colliery safe or free from explosive gases unless it be properly ventilated. The difficulty in impressing the workman with a sense of the danger by which he is surrounded forms one of the drawbacks that are experienced in endeavouring to reduce the number of colliery accidents; therefore, too much publicity cannot be given to sources of danger, that by some are considered not to exist. The pressure of the atmosphere, doubtless, exercises some influence upon the escape of gases from coal seams, but to what extent I am at present unable to say, although I am making observations with a view of bringing the subject before the Society at some subsequent period. It is hardly within the scope of the present paper to speak of the nature and properties of the gases that are met with in coal mines, but I may briefly refer to the fact that the law of diffusion of gases appears to act more tardily in the mine than in the chemist's laboratory.

Most of you present will doubtless be acquainted with the experiment of placing a vessel containing a light gas over one containing a heavy gas, and that the two gases will thoroughly mix with each other. If the lower gas is more than 20 times the weight of the upper one, the diffusion takes place in a few hours' time, and the proportions of the two gases are the same in each vessel. In the mine we invariably find the carbonic acid gas to occupy the lowest position, and the light carburetted hydrogen the higher. I have seen the carbonic acid gas to occupy a position in the lower side of a wagon road for upwards of 50 yards, the whole of which distance was so charged with the gas that a light was extinguished by putting it into the gas as suddenly as by immersing it in water, yet on the higher side of the same place a light would continue to burn in an ordinary manner. On the other hand, I have crawled for nearly a hundred yards along a level where the gas would explode on the higher side for the whole distance, and in the lower side its presence could not be detected in the safety-lamp. In fact, every-day experience proves beyond doubt that the light carburetted hydrogen gas occupies the highest stratum in the atmosphere of the mine, and carbonic acid gas the lowest, if any such gases are given off or generated. This law is not confined to places that are imperfectly ventilated, as supposed by some, but to the dead ends, or places where no current of air exists. It is possible that the difference may be caused by the gases being generated or given off more rapidly than the law of diffusion acts. It has been suggested that more time is required for the perfect diffusion to take place than is generally allowed before the gases are disturbed, but this, I think, scarcely meets the case, for I have seen places containing the gases referred to which, after being undisturbed for months, have followed the same law.

Yet if we admit the principle of the lightest gas occupying the highest position in the mine, we ought to have the highest stratum of the atmosphere less explosive than the stratum which is rendered heavier by an admixture of atmospheric air, that gives to light carburetted hydrogen the greatest explosive power; or, in other words, the greatest power of explosion is given to light carburetted hydrogen when it forms somewhere between one-eighth and one-tenth by volume of atmospheric air; and since the light carburetted hydrogen gas is little more than half the weight of atmospheric air, it must follow that the specific gravity of fire-damp decreases the less proportion of air it contains. When the admixture of fire-damp and atmospheric air is found in the proportion of five parts of air and one of light carburetted hydrogen it ceases to be explosive; therefore, upon the principle of the lightest gas occupying the highest position, we ought to have a non-explosive mixture in the highest stratum; but this, however, is not the case, for as it is well known that fire-damp is met with in many places where at the floor its presence cannot be detected in the lamp, but by raising the lamp a little the flame becomes elongated, and of a light-blue colour, and as the lamp is raised the flame gradually increases, until at the roof of the mine it will explode and fill the lamp. The same principle applies to any workings that are driven up brow, and to which law or principle I believe there is no exception.

The Safety of the Davy Lamp.—At a recent meeting of the Manchester Geological Society, Mr. Binney brought forward the question as to whether the Davy lamp is safe under all circumstances. In concluding a *resumé* of the opinions expressed upon the subject, he remarked it seemed very strange to him that, after all the leading colliery proprietors in the North and other parts of England have been preaching the infallibility of wire gauze for thirty years, Mr. Nicholas Wood now says such lamps are not safe, owing to a small quantity of oil left in the wire. Mr. Joseph Dickinson (the Government Inspector) remarked that in some collieries in this country too much reliance had been placed upon the safety-lamp; more so, in fact, than was allowed in other countries. Lamps which do not become extinguished in an explosive mixture are there prohibited, but in this country they are freely used. That was a point too little recognised, but which deserves more attention from our mining engineers than it has hitherto received.

COAL MINING:

AS IT WAS, AS IT IS, AND AS IT OUGHT TO BE.

At the closing meeting of the recent session of the Bristol Mining School (Mr. Lionel Brough, the Government Inspector, in the chair), a very interesting lecture upon this subject was delivered by Mr. Handel Cossham. After some introductory remarks, Mr. Cossham observed that the first mode in which coal was worked in this or any other country was, doubtless, by means of what is now called "open top working;" that is, drifts were driven in upon the basset, or exposed edges of the coal seams, that in many parts of the country come to the surface. The coal fields of South Wales and Dean Forest, and also our own coal field, near Kingswood, will afford peculiar facilities for this mode of working, and hence we find at a very early period they were thus worked. These open top workings may also be seen to great advantage near Tipton, in South Staffordshire, on the Ten-yard seam, where they exhibit traces of a very ancient date. You will easily understand that workings conducted on this principle were necessarily very limited and partial. Soon after the open top period of coal mining, we come to the time when it was raised by means of bucket-reels, similar to those you often see attached to cottage wells; and when the depth from which coal could be raised was necessarily limited to 20 or 30, or, at the outside, 40 or 50 yards; and probably 20 or 30 yards was the average depth. In these times, the sides of these small shafts were generally protected by timber or brushwood, and the coal was drawn up in wicker baskets, holding about one or one and a half bushel at a time. The quantity drawn from a pit by these appliances was necessarily limited, and 10 or 15 tons a day was considered a large yield. It will give a very good idea of the limited area worked from shafts of this class to note the old pit heaps, and see the number of pits often sunk to work a very small extent of coal. I have often seen as many as ten or twenty pits in a moderate sized field. I should think one acre to a pit was usually about the extent worked by means of these reeled shafts. The workings underground in these primitive pits were all of the same crude and inexpensive character. The coal was usually drawn along the roads on wooden scrages, as they were called—that is, on pieces of board laid flat on the ground, with a strip nailed at the edge to keep the sledge in its place. Boys were employed in this work, and, as it is probable that every fifty yards from the pit would cost from 6d. to 1s. per ton (by this mode of transit), it will be seen at once that the distance from the shaft at which coal could be worked was exceedingly limited. The ventilation in those days was almost entirely left to chance, there being usually no artificial means adopted of producing a regular and continuous current of air through the workings; holing from one pit to the other, which was easily done, as they were so near together. In the times to which I am referring, all water found in the mine had to be either pumped up by hand-pumps, or, what was more common, to be drawn up by the same appliance as that used in the winding of the coal. Under these circumstances, the cutting of a spring, yielding, say 50 to 100 gallons of water an hour, would usually be sufficient to drown the pit. It is somewhat difficult to ascertain what was the condition of the miners during those primitive times, but as far as I have been able to learn, from 6s. to 8s. a week would be about the average wages paid during that stage of mining to which I am now referring; and the moral and religious condition of the miner would, I fear, very much correspond with his social and physical degradation. And here let me call your attention to the fact that the interest and prosperity of the "worker" in connection with any commercial undertaking will always pretty much correspond with the scientific position of the calling itself. Let the machinery by which any pursuit of a commercial character is to be accomplished be rude and rough, let the labour required in its production be unskilled and merely physical, and the natural and almost necessary result will be that those engaged in such an employment will be ill-paid, uneducated, and socially and morally degraded. I believe, therefore, that the interest of the working collier is bound up and associated with the progress and increased efficiency with which mines are worked. I know there is a rather wide-spread belief among working men, that the introduction of machinery and mechanical contrivances in any calling tends to diminish labour and injure them; but the history of our country, and all the experience of the past, tends to contradict and disprove this opinion, and to show that while the introduction of machinery may have sometimes tended to temporarily injure a particular branch of some great national industry, yet that, as a whole, and in the end, it has greatly benefited the condition of those working in that particular trade. But to proceed, the next, or third, stage in coal mining was what may be called the "horse-gin" period, when pits were sunk to the depth of 40 or 50, and, in some cases, even 90 or a 100 yards, by means of a drum or cylinder formed of wood, and to which two, or sometimes four, arms were attached, by means of which horse-power could be applied, and a considerable quantity of coal was thereby raised. The process of winding by this means was necessarily slow, as compared with our present process, and the results, as compared with what is now done, exceedingly small. Still, it was a great improvement on the past, and must be regarded as a considerable march in the progress of mining. The greater depth to which pits were now sunk required that the sides should be better secured and lined, and hence we find that at this period the walling or lining of the shafts was first adopted. The quantity usually raised from collieries worked by horse-gins was from 20 to 30 tons per day, or, say, double the quantity raised by the hand-reels. The arrangements underground, also, began to undergo improvements at this time, and with those improvements the condition and pay of the colliers, and I hope the profits of the masters also, improved. The Kingswood Hill Collieries, which are among the oldest in this neighbourhood, and perhaps in the country, were worked by means of horse-gins up till near upon the dawn of the present century, the first steam-engine for drawing coal having been erected there about the year 1798. The neighbourhood of Kingswood, also, affords a remarkable and interesting proof of the skill and perseverance of our forefathers in the draining of these mines. There are two large culverts or drains driven right through the hill at Kingswood, a distance of some two miles, for the purpose of draining the mines of that district to the depth of 60 yards, and thus laying dry the whole of the coal above that level. I think this was one of the most spirited, persevering, and successful efforts at tunnelling made in the olden times. In many cases, during the horse-gin period,

arrangements were made for draining the mines by means of water-power, applied by water-wheels; this, of course, could only be done where water could be obtained from a higher level than the pit top, such as on the side of a hill or cliff. I have not yet noticed the working of coal by means of "levels," as that is not confined to any particular period, and cannot be considered as a distinct epoch in the history of coal mining. It is a mode of working adopted from the earliest dates at which coal has been raised in this country, and is still used where the circumstances are favourable to its application. The students of this institution are doubtless aware that in Wales and the Forest of Dean this mode of raising coal is extensively resorted to still, and where it can be adopted it is the least expensive and safest method of raising coal. The next stage in the progress of mining was reached by the application of steam-power—first, to the drainage and drying of mines, and then to the use of steam-power for winding. This improvement dates back to about the year 1799, and was followed by another grand march in the path of progression, by the application of steam-power to winding, which began in or about the year 1800. With the introduction of steam for winding and pumping, and the increased depth to which coal mines now began to be carried, came the necessity of improving the mode of transit underground, and the application of mechanical power and artificial ventilation in the working of mines. This brought into use—first, the old cast-iron tramrails, made thus ⊔, laid upon sleepers, and nailed down. These were soon followed by wrought-iron rails and trams constructed to run upon roads, laid up to the working face. The first class of steam-engine used for pumping water or winding coals in this country, was the old atmospheric engine, but it was soon found that the speed at which these engines could be worked was slow, and that their tendency to choke, and liability to derangement, rendered it necessary to apply steam-power in a more simple and efficient manner, and hence the introduction of Boulton and Watt's double-acting condensing engines, some twenty years ago, and then of the high-pressure steam-engine, which, though a little more costly to work, on account of the extra fuel consumed, is nevertheless much more satisfactory in its working, and profitable in its results, as a winding process.

I think I have touched upon most of the main features of coal mining "AS IT WAS," and showed the various stages through which it has passed, and my object will now be to refer to coal mining "AS IT IS." There can, I think, be no doubt that, as compared with the past, and also, I believe, compared with other countries, our mining, as now conducted, is in a very efficient condition, and is worked in a very scientific manner. That there is much room for improvement and reform in our modes of working and general arrangements I am quite ready to admit, and in doing so I only admit that we are subject to the same human imperfections and liability to err that characterises and pervades all other branches of our national industry. In order to lay before you as fully and briefly as I can the facts that will enable you to form a pretty correct idea of coal mining "as it is," allow me to describe some of the arrangements now adopted at those collieries which may be considered as well conducted and efficient.

I. THE PITS.—These are now generally sunk of much larger diameter than formerly, and the tendency is evidently to increase the size of shafts. From 6 to 12 ft. may now be considered as the ordinary size of pits. It is also usual to wall or line shafts with brick or stone, and in my opinion no shaft is really secure that is not thus lined. Even the strongest rock will now and then, after frost, or from the constant friction of the air against the sides, shale off, and cause danger, and sometimes loss of life. To leave any pit unwalled, except under very exceptional circumstances, is, therefore, not in my opinion wise or safe, and am glad, therefore, that there are now very few cases in which it is done. But all pits ought also to be fitted up with guides. I do not say that a pit is positively unsafe without them, but I do say that no shaft can be worked with efficiency and satisfaction unless guides are adopted. Under the head of shafts, perhaps, it will be better for me to refer to the application and working of pumping-power in our best conducted mines. I have lately had the pleasure of examining one of the most splendid pumping-engines in the country at the Clay Cross Colliery. The cylinder is 7 feet in diameter, stroke 10 ft. The beam is wrought-iron, and weighs about 30 tons; each leaf is 42 ft. long, 7 ft. wide in the middle, nearly 5 feet at the ends, and 2 in. thick, and weighs nearly 10 tons. The gudgeon on which this huge beam works is 16 in. in diameter; the depth from which the water has to be brought is 140 yards, and it is done by means of two lengths of pumps and two pumps in each length, hasped off from each side of a rod 15 in. square; the weight lifted every stroke is 36 tons, and the quantity of water brought to surface is 220 gallons every stroke, by means of two 18-inch plunger pumps. This engine would work with safety 8 or 10 strokes per minute, and is capable, therefore, of raising over 2000 gallons of water per minute, or 120,000 gallons an hour, or 1,440,000 gallons in twelve hours—call it 1½ million gallons a day. This may be almost looked upon as the perfection of pumping machinery, and will well repay a visit by any of the students in the school.

II. UNDERGROUND ARRANGEMENTS.—These have also undergone great improvement; the object now is to carry rails up to the face of the work, so as to do away as much as possible with the necessity of shifting the coal, and thus prevent breakage and loss; it also tends materially to lessen the cost of transit underground, and prevent the useless expenditure of manual labour. Horses or stationary engines are now almost universally applied for working the main roads of the colliery, so that coal can now be won a mile, or even further, from the shaft cheaper than it could be brought to pit 100 yards off some 50 or 60 years ago. Engine-power is also usually employed now for bringing coal from the dip, and brake wheels and other mechanical contrivances for bringing it from the rise. Engine-power would doubtless be applied much more extensively underground, in various ways, but for the danger and trouble attending the carrying off of the smoke and steam; this has led in some places to the adoption of engines worked by compressed air, and I am told that these have been found very successful; but, as I have not had an opportunity of seeing them in action, I cannot speak with certainty about them. Arching with bricks or stones the main roads or branches is also now extensively practiced, and is found in the long run to be most economical and safe, and I believe its more general adoption will be attended with the best of results. Gas is also being extensively used underground, as well as for lighting the surface of mines. It is, of course, not easy to apply it to the lighting of the working faces on account of their shifting character, nor would it be safe to thus use it in fiery mines, even if it could be more easily applied. In most extensive collieries, however, it can be used with great advantage for lighting the surface, the pit bottom, and main roads. The way in which gas is carried down the mine is by means of water passed down the pipe, thus creating a vacuum which causes the gas to follow.

The mode of ventilating collieries has also undergone vast improvements. Instead of trusting to natural ventilation, which was merely trusting to chance, in all well-conducted collieries now artificial modes of ventilation are adopted, either by means of the furnace, the steam-jet, or some mode of pumping the air. The furnace is the method usually adopted, and though open to some serious objections is, in my opinion, the simplest and safest yet adopted. It is, I am aware, attended with some danger in fiery mines, but that can be overcome by carrying the return air from the mine up a dumb-drift into the up-cast shaft, independent of the furnace, and feeding the furnace fire with fresh air from the down-cast. The use of the furnace is also somewhat inconvenient in drawing shafts, and has a tendency to injure the guides, and make it unpleasant to travel in them. The steam-jet is also open to the same objection, and the application of machines for forcing or pumping air usually require that a separate shaft shall be devoted to the purpose, a condition that is often so costly and inconvenient that it cannot be adopted. You can see one of the latter machines in operation at Messrs. Knight and Co.'s works, at Ashton Vale, where it has been well and successfully applied. I attach a good deal of importance, as a matter of safety and economy, to the subdivision of labour underground. I believe it is always best, as far as possible, to put the different operations in mining under different staffs of officers and men; it tends to efficiency, economy, and safety to do so. This plan is now generally adopted in most mines, hence the coal getting, filling, timbering, road laying, branching, &c., is usually done by separate classes of workpeople, and I am persuaded that the results are eminently advantageous and satisfactory. The condition of the working collier is another important element in looking at mining "as it is," and I believe there can be no doubt that there has been a most marked and striking improvement made in the condition of those engaged in the arduous and dangerous occupation of mining. The collier is now better paid, better educated, and far more under the influence of civilisation and Christianity than he was. I do not pretend to say that all has been done that can and ought to be done in this direction, but the advance made is great, and the results obtained eminently satisfactory.

The quantity of coal now raised varies a good deal, according to circumstances, but in first-class collieries it may be taken at from 300 to 600 tons per day. There are cases in which more than this is done. I lately visited a colliery belonging to Mr. Barrow, of Staveley, where he raises about 1000 tons of coal per day, in about 10 hours, from a depth of 200 yards. This pit, called the Seymour Pit, in honour of its able viewer, is one of the best specimens of what can be done here. They make from 70 to 80 trips per hour in the shaft, and draw about 25 cwts. at a time, bringing to bank 100 tons of coal every hour. Two enginemen are retained at the engine, and they change and relieve each other about every hour. The onsetting and banking is done with remarkable precision and speed. The cage brings up two tubs on the same platform, end to end, and before the cage is fairly on the rests, these tubs are on the way out, and the empties are following in behind. The same precision is exhibited at the bottom, and also throughout every department of the work. In concluding this part of my lecture I may just refer to the fact that, as greater depths have to be reached, I believe round ropes, working on conical drums, are being more generally adopted. The best application of this principle that I have seen is at the Duke of Newcastle's colliery, at Shire Oaks, near Nottingham.

In next week's Journal we shall give the concluding portion of Mr. Cossham's paper, in which MINING AS IT OUGHT TO BE is very amply defined.

THE NOMENCLATURE OF THE COAL SYSTEM.

At the Manchester Geological Society, Mr. JOHN ATKINSON (the hon. sec.) said: I have here a paper that involves a question which may be interesting to the members of the society. In a paper read by Prof. Ansted at the Society of Arts, amongst other subjects he mentions anthracite and Boghead Cannel, and states, after reasoning on the subject, and bringing forward proof to support his position, that the Boghead mineral would never in this country have been recognised as a coal, &c. The question I want to put to the meeting is whether they consider Boghead Cannel a shale or a mineral of some other character?

Mr. HULL: I think we should ascertain in the first place whether there is any lawsuit pending upon the subject.

Mr. BINNEY: In reading the article to which Mr. Atkinson has called attention, there is another point which the coal proprietors of Lancashire ought to consider. As for the Boghead coal, we had better keep clear of the subject altogether, for it is a very litigious question. There is one thing which Prof. Ansted states which we Lancashire people, and I think the Yorkshire people too, must regard as somewhat singular, and scarcely admit to be true. He gives a description of the various kinds of coal. In No. 545 of the "Journal of the Society of Arts," he says:—"Some kinds of coal, especially of the Newcastle coals, cake, or run into a kind of slag, while burning; other kinds, such as Yorkshire and Lancashire coals, burn through without caking, and fall to a white and red loose powdery ash." Now, any gentlemen who are accustomed to good King, Yard, Orrel, Black Mine, Arley, Doe Bottoms, Cliviger, and some other Lancashire coals, will not allow this to go as correct. There are many really excellent coals here, more in number than in Newcastle, and some of them being in fact nearly as good as any you find at Newcastle for caking and coking purposes. To say that Lancashire and Yorkshire coals leave, on being burnt, nothing but white and red powdery ash is, to say the least, simply incorrect; and the opinion of a gentleman who undertakes to treat a subject when he knows so little about it certainly ought not to be taken as worth much.

Mr. KNOWLES: Whatever this gentleman may think, it does not alter the value of the article to which he refers. As long as the proprietors can sell their coal for as much money as they ask, it does not much matter about such remarks. They do not alter the market value of the article.

Mr. E. HULL: The proper way, I think, would be to answer that abstract of the report by a letter to the "Journal of the Society of Arts," contradicting the assertion which is there made. There are half-a-dozen seams at least that make very good coke, and are used for that purpose. Anything contrary to fact ought to be put right.

Mr. BINNEY: There are other mistakes in the same paper. He talks about Torbane Hill mineral (No. 4 in his list) and Boghead, and other rich Cannel coal like Scotch minerals (No. 5), as if the two coals were different substances, when it is well known they are the same seam of Cannel coal, there being only a fence between them, the estates of Torbane Hill and Boghead adjoining to each other.

The PRESIDENT: I have all my life been in the habit of naming strata, and am accustomed to the names by which they are known in every colliery district in England, and I may also add in different parts of Scotland, but never, until the trial took place between the lessee and lessor in Scotland, did I hear that a coal ceased to be a coal and became a shale, when it became a good coal. We have had general principles upon which strata have been named. Shales have been classed as a body, and the sandstones as a body, and the coals as a body. If the coal became mixed with the shale it would sometimes be called a bass, or bassy or shaly coal. Or if the shale predominated, but became impregnated with coaly matter, it would be called a coaly, bituminous, carboniferous, or bassy shale. But that the coal became a shale when it became a rich coal I never heard until this trial took place. In fact, it is setting aside all the landmarks upon which there is any reason for guidance in the naming of strata.

Mr. BINNEY: One thing is certain about this mineral, that for years after it was first discovered it was called and known by no other name but parrot or Cannel coal. Mr. Russel, the lessor of the mine, called it by the same names; and Mr. Gillespie, when he was first attempting to sell it, never called it anything but parrot or gas coal. I myself went and bought 10,000 tons of it as coal, and there was no dispute then. It was only when the value of the thing got up that there was any dispute. In fact, money was the origin of the dispute. I place great value on the late Mr. Peace's opinion, who, at the time he examined the mineral, had wrought more Cannel than any other man, and he, after a personal examination of the coal, and seeing it in the mine, pronounced it to be a good Cannel coal.

The PRESIDENT: The coal family is a very large one, and there is a great number of varieties. I have known some of the best splint coals of Scotland pronounced, by persons who did not know them, to be black stone. But, of course, a mistake in naming them so does not make them black stone and not coal.

Mr. SPENCE said, after all, these were only matters of opinion, and what was really wanted was some definite line of demarcation.

The PRESIDENT: At present we have a very good line amongst us, but, if the Professor's opinions are taken, we shall be at sea without a chart or guide of any kind.

Mr. ALDERMAN HARVEY: What is the thickness of this disputed bed?—Mr. BINNEY: Thirty-two inches is the greatest thickness I have seen; but it goes to 2 or 3 in. It comes out in large cubical blocks, just like Cannel.

Mr. HULL: How long do you expect it to last at the present rate of consumption?

Mr. BINNEY: The area it occupies is limited. A few years, in all probability, will see it worked out. All the Scotch coals (the parrots), to us who have been accustomed to see the bright and lustrous Wigan Cannel, look black and dirty. I work in Fife Pirnie parrot, and a part of the seam is so like Boghead that no one can distinguish it from that coal. Yet Pirnie or Methill has been known in the market as a coal, and never questioned, for nearly 30 years.

The PRESIDENT: The brownest parts of the Methill and Wemyss Cannel coal are undistinguishable from the Boghead or Torbane Hill coal. As you pass from the bright Cannels through to the dull blacks they become richer, and as they approach the brown they become richer still.

Mr. KNOWLES: What was the name given to the discovery of the mineral in North Wales, because there was a coal with it in the same mine similar to the Torbane Hill coal?—Mr. BINNEY said that Leeswood Cannel coal have never been questioned.

The PRESIDENT said the society ought to be very much obliged to Mr. Atkinson for bringing the subject forward, because, if left unnoticed, it might seriously affect the whole nomenclature of the coal system.

Mr. KNOWLES said this district had settled what it was; and it was once settled in a Court in Edinburgh that it was coal. If any further change were made in sinking in any new district provision would have to be made in the lease as to whether the shafts were sunk for coal or not.

The PRESIDENT said it was not desirable to have these frivolous distinctions, which are without a difference, put into leases; there are too many already.

Mr. ATKINSON: What are the strata above it?—Mr. BINNEY: Regular coal measures, and it had a good floor, full of stigmaria, like other coal seams. Some parts of it were brown and others black parrot. The term clay might be made the subject of as many disputes as coal, if men who know nothing about it but what they derived from bookmakers and hired witnesses, instead of sound practical men, who mined and wrought it, were to be consulted on the matter.

MINERAL RESOURCES OF BRITISH NORTH AMERICA.

A work of considerable importance to Canada and the neighbouring provinces is at present in the press, entitled "Eighty Years' Progress in British North America," and amongst its varied contents will appear a sketch of the nature, extent, and value of the metals and other useful minerals found in Canada, Nova Scotia, New Brunswick, and British Columbia, with an account of the Mining Industry in these provinces, by Mr. Charles Robb (of Willson and Robb, Montreal) under the title of the "Mineral Resources of British North America." We have before us the proof sheets of this portion of the work, and have no hesitation in saying that it contains a vast amount of very interesting information; and as there is little doubt but that much British capital will be applied in the development of industrial enterprise in our North American provinces, the essay, if we may so term it, is one likely to be extensively read in this country.

With the exception of coal, and a few of the less important metals, Canada has been found to produce almost all the known useful minerals, while, with regard to most of them, it may be safely asserted that she contains within herself not only amply sufficient for her domestic consumption, but for permanent, profitable, and extensive foreign commerce. As the resources of Canada are now rapidly becoming known to the rest of the world, and as it is gradually learning greater self-reliance, it may be reasonably expected that its mineral productions are destined to assume their true rank in contributing to the national wealth and prosperity. That coal does not occur in any of the settled and explored parts of the country may be regarded as a fully established fact, but Canada is favourably situated in its proximity at all points to the carboniferous regions of the United States and Nova Scotia, and in the facility of conveyance afforded by its vast lakes, rivers, and canals; and, moreover, it contains within itself such ample supplies of wood, peat, and mineral oil as will go far to compensate for the want of coal.

The several metalliferous products of commercial value found in Canada are treated of under separate heads. Most of the beds of iron ore are of great extent and thickness, and of excellent quality, yielding 60 to 70 per cent. of pure iron; indeed, the supply of iron ore in Canada may be regarded as practically inexhaustible. The ore consists chiefly, in several districts, of the magnetic oxide of iron, which is the same species, and occurring in the same geological formation, with those from Sweden and Norway, from which the celebrated Swedish iron is made. Hitherto no available deposits of zinc have been discovered in Canada, although this metal is known to exist at many places, and may yet become of economic importance. The occurrence of galena has been reported in many localities. The most important is that now known as the Ramsay Lead Mine. Copper undoubtedly constitutes the most important of the mineral treasures of Canada, and is destined to occupy a prominent rank among the resources of the country. The Montreal Mining Company's works, the Wellington Mine, the Bruce Mine, and others in the Lake region, are referred to, and with regard to those of Canada East the accounts of the Acton and Harvey Hill Mines are well worthy of attention. The most remarkable instance of the occurrence of nickel is in the island of Michipicoten, where it exists in the form of arsenurets and silicates. Silver, gold, chrome iron, iron ochres, sulphates of barytes, steatite or soapstone, lithographic stone, mica, plumbago, mineral manures, hydraulic cement, roofing slates, are in turn referred to, and chapters are also devoted to peat and petroleum.

The mineral resources of Nova Scotia, New Brunswick, and Newfoundland are then treated of, the statements made being principally on the authority of Dawson's very valuable work—"Acadian Geology." As there are doubtless many of the readers of the *Mining Journal* connected with mining in Canada who will desire to obtain copies of the essay to which we have referred, we have ordered a supply to be forwarded to our office as soon as the work is issued.

MONEY MAKING—No. VII.

The mouth of the trumpet stands up 3 or 4 inches above the floor, and through it passes an iron rod down to the pin of the press, to which it is attached by a nut. The rod is connected to a vibrating balance-beam. From the other end of the beam, which is 8 ft. in length, depends another rod, and this is fastened to the piston of an open-topped vacuum-pump, the cylinder of which is very short, but 12 in. in diameter. It is desirable still to confine ourselves to the details of one press only, because all are precisely alike, and the doing so simplifies description. The cylinder is in communication below the piston, by means of a small copper exhaust-pipe, with a Vacuum Chamber on the basement, of which more anon. When the cylinder is exhausted, the atmospheric column presses on the piston with just sufficient force to hold in equilibrium the screw-pin of the press, its fly-arms and weights, and the upper die-holder. So perfectly is the balance maintained in this way that the press may be moved up or down by the pressure of the hand, and this freedom of action is invaluable in setting the dies and otherwise adjusting the press for its work.

A wrought-iron lever of considerable strength, and some 20 in. long, is keyed upon the upper end of the trumpet-shaft, and just clears the floor. The lever has a sliding socket, with a wedge-like key for fixing it at any distance from the centre of the trumpet, in accordance with the power to be transmitted through the press, and the impact force with which the planchets are to be struck. If a florin is to be coined the maximum blow will be required, and the socket is affixed at the extremity of the lever. If a quarter-farthing (and these are occasionally coined for Ceylon), the minimum impact will be necessary, and the leverage is shortened accordingly. Through an eye in the socket a steel pin passes, and this serves to connect the lever by means of a horizontal rod, with a "horse-head" crank standing over another vertically-placed and open-topped vacuum-pump. From the crank another rod is dependant, and this is attached to the piston of the pump. This latter is in communication by means of a 3-inch pipe and an internal disc-valve, with the vacuum-chamber before referred to. It will now be understood that a connection may be made at an instant's notice between the striking-pump, as it may be termed, and the chamber below, by simply opening the inner valve. The pump itself consists of a cylinder of cast-iron 24 inches in length and 12 inches in diameter, and which is bored out as smooth as a mirror. The piston is of iron, and is clothed with leather, tapered at the top to a knife-edge The vacuum-chamber consists of a tube of cast-iron, 60 ft. in length and 2 ft. 6 in. in diameter. It extends itself beneath the whole series of striking-pumps, and is exhausted to an extent adjustible by a barometer-gauge and a relief valve. The means of exhaustion consist of a double-acting air-pump of peculiar construction, and the application of which was suggested in 1851 by Mr. Newton, of the Mint. The Messrs. Rennie manufactured the pump, with the exactitude for which that eminent firm is celebrated.

Confining ourselves, as before, to one press and its accessories, a description of which will answer for the whole, it may be stated that an indexed stop-cock is placed in the connecting pipe between the striking-pump and the vacuum-chamber. The object of this is to afford a ready means of cutting off communication between the two if necessary, and of diminishing, by attenuation, the vacuum in the pump, as compared with that in the chamber. The chamber itself is in one sense a reservoir of power for the whole of the eight presses.

The internal or pneumatic valve is under the control of the attendant on the coining press on the other side of the thick wall of the pump-room by means of a starting line. A second disc valve in the base of the striking-pump opens outwardly to the atmosphere. This also is under the control, to some extent, of the press-boy. He has the power, by releasing a line at his elbow, of preventing its closing, and thus stopping his press instanter.

It will now, we trust, be comprehended that the communication between the press and the atmospheric power to be applied to it is in all respects complete. Let us, then, return to our long-neglected bag of golden planchets in the press-room. The boy sitting quietly but watchfully in the hole before the press, has received his modicum of the treasure, and has filled his feeding tube with the precious discs. He next pulls the fly-arms of the press to the starting point, marked and governed by a stiff ashen staff with a brass feruled end, and projecting from the cross-bar. Whilst doing so the plyers clasp and carry forward to the lower die a planchet from the base of the tube. All, therefore, is ready for a start, and the boy simply awaits a signal for making it. It is given. A sharp tug at the starting line opens the pneumatic valve of the pump. The air which was within it rushes to the vacuum-chamber. The atmospheric column presses down the piston with force and rapidity, and thus brings with it the screw-pin of the press, with its inverted upper die, upon the planchet.

A milled or serrated collar of steel, fitting easily over the neck of the lower die has risen by the action of springs beneath it, and encompassed the piece of gold at the moment of impact. The result of the squeeze or blow is that both sides of the planchet are decorated at once with the devices so familiar to many, and so pleasant to contemplate when in our own possession. At the same time the plastic gold is expanded, so as to fit tightly the fluted collar, and to take from it an imprint of its flutings, or milling. One stroke, indeed, has converted an apparently shankless, double-gilt, plain button into a glittering and beautiful sovereign. The instant that this marvellous change has been effected, the press-pin rebounds from "the shock itself has given," and the feeding plyers advance with another planchet. The collar is simultaneously and forcibly depressed by self-acting means, and the struck coin is rudely pushed from its seat by the advance of the steel feeder with its successor. Again the press-pin and die descend, the collar rises to form a mould, as it were, around the newly-arrived planchet, and another coin is created. These operations are repeated to the rather noisy tune of sixty times per minute, and coined sovereigns slide down a copper inclined-plain, and into a receiving pan, at the same rate.

The press attendant has now to keep a sharp eye to the movements of the apparatus, and take care to feed it at a speed commensurate with its appetite, which is most voracious. The eight mint presses are capable of producing 200,000 sovereigns, or any other coins, per day. Passing forward, and reviewing, as it were, the line of presses, we perceive that they are being fed with planchets, and are yielding sovereigns in continuous and dazzling streams, whilst over-lookers are collecting and examining with critical eye the accumulating coins.

LOCOMOTIVE ENGINES.—An invention has been patented by the Rev. Henry Moule, M.A., of Fordington, according to which he proposes, in constructing locomotive engines, to make the ashpit of the engine of suitable capacity, so that it shall be water-tight, and when closed as nearly as possible air-tight, he leads into it a steam-pipe from the boiler. Into the ashpit, through an opening provided for the purpose, he introduces a charge of bituminous coal, together with oil, or oily substance, vegetable or other, and water, and then by means of a suitable cover fitted to the opening, he closes the ashpit as nearly as possible air-tight. The charge thus put into the ashpit is sufficiently large to last for the whole journey the locomotive is intended to make. On the fire-bars within the furnace of the locomotive he lays, in alternate layers, coal or coke and chalk, limestone or lime, until the furnace is sufficiently full, he then lights the coal or coke. Air to support combustion is admitted to the furnace above the fire-bars. When the contents of the furnace are well hot and steam commences to be generated, he allows it, or a portion of it, to pass into the ashpit, and from thence, with the gases and vapours generated by it and by radiation and conduction of heat from the furnace, it escapes into the furnace, where it excites a vivid combustion, which continues so long as the steam is allowed to enter the ashpit. From the consideration of the invention it will be assumed that it is some time

since the inventor was at college, for he must entirely have forgotten even the very hackneyed maxim *ne sutor ultra crepidam*. The invention is altogether incapable of economic practical application, and it is to be hoped that the inventor's theology is better than his engineering theory.

SALES OF COPPER ORES.

COPPER ORES SOLD AT THE CORNWALL TICKETINGS FOR THE QUARTER ENDING JUNE, 1863.

Mines.	Tons.	Amount.
Devon Great Consols	6330	£30,599 14 6
Clifford Amalgamated	3591	17,631 10 6
South Caradon	1484	12,391 4 6
West Seton	1704	8,653 15 0
West Basset	1416	7,290 4 6
East Caradon	1433	6,670 5 6
Fowey Consols	1043	5,391 10 6
Wheal Seton	1034	5,388 15 0
Phœnix	1418	4,903 10 0
Marke Valley	1219	3,776 2 6
Par Consols	620	3,740 8 6
South Frances	606	3,538 7 0
Great Wheal Busy	1271	3,450 4 6
Craddock Moor	550	3,050 7 0
West Caradon	466	2,882 9 0
East Pool	808	2,811 3 6
Wheal Basset	504	2,970 8 0
Great South Tolgus	345	2,851 8 6
Bedford United	610	2,761 18 6
South Tolgus	541	2,752 18 0
West Damsel	773	2,750 16 0
East Carn Brea	502	2,581 17 0
East Basset	420	2,553 12 0
Wheal Friendship	388	2,523 5 6
Carn Brea	500	2,132 15 6
Tywarnhaile	485	2,098 12 6
North Roskear	295	1,883 12 0
North Treskerby	407	1,758 9 0
Prosper United	519	1,744 17 6
Levant	347	1,734 9 6
Bampfylde	120	1,575 9 0
Devon and Cornwall	570	1,455 17 0
Brookwood	292	1,354 0 0
Hingston Down	405	1,333 9 0
Copper Hill	317	1,331 10 0
Wheal Grenville	214	1,320 2 6
Wheal Emma	389	1,232 4 0
Wheal Crelake	309	1,229 4 0
New Wheal Martha	426	1,210 5 0
Holmbush	190	1,207 2 6
Treloweth	232	1,182 9 0
North Downs	198	1,148 7 0
Rosewarne Consols	157	1,106 17 6
Wheal Polmear	201	1,061 5 0
Botallack	146	1,011 18 0
Great Brigan	199	963 1 0
Kelly Bray	206	936 10 0
Dolcoath	188	935 17 0
East Rosewarne	113	927 16 6
Wheal Buller	195	917 5 6
Tincroft	235	805 14 0
West Fowey Consols	122	761 14 0
Wheal Edward	222	746 15 0
Alfred Consols	220	736 5 0
Wheal Anna	120	643 17 6
North Wheal Robert	206	638 16 6
Tolcarne	175	624 13 0
East Wheal Russell	152	609 13 0
Wheal Margery	150	594 18 0
Pendeen Consols	209	557 17 0
Gunnis Lake	113	556 15 0
Lady Bertha	248	540 16 0
West Stray Park	85	524 13 6
Sortridge Consols	93	522 18 6
New Treleigh	164	509 12 6
Tolvadden	119	483 0 0
Great North Downs	99	478 2 6
Stray Park	116	461 7 0
Gurlyn	88	459 11 0
Wheal Yarner	175	441 17 6
Wheal Arthur	122	406 9 0
Wheal Uny	68	379 18 0
Condurrow	122	372 17 6
Camborne Vean	71	344 18 0
St. Day United	100	316 14 0
Wheal Anna	54	295 13 0
Hawkmoor	68	284 3 0
Wheal Crebor	82	272 13 0
Wheal Harriett	78	261 1 6
Molland	50	251 5 0
Falmouth and Sperries	66	230 10 6
Fursden	64	223 8 6
North Crofty	40	215 0 0
South Crinnis	52	211 18 0
Camborne Consols	27	206 19 6
Barratt's Ore	5	205 0 0
West Tolgus	50	201 5 0
North Grambler	38	192 17 0
NorthBasset	64	181 16 0
South Crenver	58	185 4 6
Nangiles	28	165 18 0
South Bedford	81	147 7 0
New Rosewarne	20	146 0 0
South Crofty	40	141 13 0
East Alfred Consols	36	141 6 0
Boscawen	32	138 8 0
Carn Camborne	41	121 18 6
Wheal Florence	14	120 15 0
Grambler and St. Aubyn	23	119 1 0
East Wheal Grenville	42	117 6 0
Burra Burra	35	116 7 6
Great Wheal Alfred	52	112 5 0
Pedn-an-drea	29	110 18 6
Wheal Agar	20	105 0 0
West Alfred	76	98 0 0
North Frances	17	94 7 0
Rosewarne United	28	86 6 6
Collacombe	27	83 0 6
South Dolcoath	7	77 7 0
South Carn Brea	25	71 17 6
Crane	7	65 13 6
Wheal Vyvyan	22	64 14 0
West Wheal Trevelyan	17	61 4 0
Wheal Damsel	18	60 13 0
Aver's Ore	2	57 0 0
Furze Park	5	54 5 0
South Basset	21	54 1 6
St. Austell Consols	11	42 7 0
Castle and Boswidden	1	41 7 6
Creegbrawse	9	39 3 0
North Phœnix	7	31 10 0
New Wheal Seton	5	30 7 6
Wheal Jane	9	29 9 6
Tredinnick's Ore	35	24 17 0
Wheal Trenwith	2	23 5 0
West Tolvadden	9	22 10 0
St. Aubyn and Grylls	4	16 6 0
Wheal Ellen	6	14 14 0
Wheal Moyle	7	13 16 6
Wheal Prosper	4	13 2 0
Great Crinnis	4	7 2 0
Total	41,922	£198,895 3 0

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
Vivian and Sons	5356	£29,631 13 8
Freeman and Co.	2061	9,656 0 4
Grenfell and Sons	3778	20,921 3 10
Sims, Willyams, and Co.	5142	26,463 7 2
Williams, Foster, and Co.	5207	27,358 11 7
Mason and Elkington	4141	18,848 3 1
Bankart and Sons	1594	6,283 15 6
Copper Miners' Company	3997	17,851 18 6
Charles Lambert	4270	13,180 3 6
Newton, Keates, and Co.	1061	5,450 5 7
Sweetland, Tuttle, and Co.	1727	5,926 12 7
Neath Copper Company	1999	9,999 0 4
Pencla wdd Copper Company	1589	7,321 7 4
Total	41,922	£198,895 3 0

MINERS' LAMPS.—Mr. Peter Bourne, of Whitehaven, has provisionally specified some improvements in miners' lamps, which consist of means for extinguishing the light of the lamp in the act of opening the lamp, and before the gauze covering can be removed from the lamp. For this purpose he attached to the lamp near to the wick-holder an apparatus consisting of one or more levers mounted on a suitable fulcrum, bearing or bearings, and which apparatus is capable of being depressed on the wick by the act of removing the wire-gauze covering. This apparatus is by the action of a suitable spring or springs, or by the weight of the short end of the lever or levers aforesaid, or by both of such means, kept out of the way of the ignited wick so long as the gauze covering remains on the lamp, or when the gauze covering is being placed on the lamp; but as soon as any attempt is made to remove the gauze covering one or more small projecting piece or pieces attached to the mounting of the gauze covering is forced under the short arm of the lever (or of each of the levers if more than one), which short arm is thereby, and by the unscrewing of the gauze covering, elevated, and thus the other end of such lever, or levers, is depressed on the wick, and so the wick is pressed down, and the light becomes extinguished.

SALES OF COPPER ORES.

COPPER ORES SOLD AT THE SWANSEA TICKETINGS FOR THE QUARTER ENDING JUNE, 1863.

Mines.	BRITISH. Tons.	Amount.
Berehaven	3288	£27,657 10 6
Knockmahon	2022	15,891 2 0
Laxey	574	2,642 17 6
Connorree	276	1,054 2 6
Ballycummisk	125	855 11 0
Cappagh	77	727 15 0
Slag and sundries	122	679 11 6
Tigrony	2	45 4 0
Cronebane	2	45 1 0
Calder Glen	7	30 16 0
Phœnix	2	9 10 0
Total	6497	£49,639 1 0
COLONIAL.		
Cape Copper	720	£16,433 14 6
Western Australian	258	4,149 11 0
Kanmantoo	79	4,123 7 6
Yudanamutana	125	3,417 0 0
Spectakel	100	3,121 15 0
Great Northern	92	1,758 9 0
New Cornwall	42	757 1 0
Wheal Ellen	14	439 5 0
Worthing	9	321 15 0
Concordia	25	294 3 6
Gualla	5	118 1 0
Brada United	32	105 12 0
New South Wales	1	10 15 6
Total	1520	£35,050 10 0
FOREIGN.		
Cobre	3467	£41,500 9 6
Chili	913	12,063 13 6
Bolivian	536	8,733 8 0
Cuba	579	6,286 15 0
Lisbon	235	4,735 14 0
Sestri	127	1,329 7 6
Genoa	122	648 13 6
African	38	477 2 6
Bilbon	53	96 14 6
Total	6070	£75,871 17 6
RECAPITULATION.		
British	6497	£49,639 1 0
Colonial	1520	35,050 10 0
Foreign	6070	75,871 17 6
Total	14,087	£160,631 8 6

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
Copper Miners' Company	1080	£10,704 5 11
Freeman and Co.	1086	10,059 2 6
Grenfell and Sons	1699	23,419 11 6
Sims, Willyams, and Co.	1647	18,635 15 9
Vivian and Sons	2012	23,655 5 8
Williams, Foster, and Co.	2900	28,106 0 0
British and Foreign Copper Company	91	1,492 1 4
Mason and Elkington	373	5,381 14 0
Bankart and Sons	600	7,223 16 5
Charles Lambert	743	10,412 4 4
Ravenhead Copper Company	177	1,785 1 6
Sweetland, Tuttle, and Co.	441	4,969 19 4
Jennings and Co.	315	4,522 16 3
Neath Copper Company	752	8,209 16 6
Penclawdd Copper Company	171	2,053 18 3
Total	14,087	£160,631 8 6

FOREIGN MINING AND METALLURGY.

Although no great amount of animation appears to prevail in the Belgian iron trade, the state of affairs is far from being unfavourable. Deliveries of rails of all kinds are well sustained, the demand is daily increasing, and several works are overcharged with orders; but, on the other hand, pig finds outlets with difficulty, and remains at very low rates. The majority of workshops of construction are well provided with orders. The John Cockerill Company has contracted with the Russian Government for the delivery of two armour-plated ships, of the value of 160,000*l*. During the first four months of the current year the exportation of pig amounted to 10,643 tons, of which 9518 tons were for France, 568 tons for Germany, 445 tons for Holland, and 105½ tons for Switzerland. During the corresponding four months of 1862 the export attained a total of 12,484 tons. The exportation of rails from Belgium has considerably increased this year. From 8439 tons, the aggregate attained in 1862, the movement has been carried this year to 14,149 tons, the total discomposing itself as follows:—Germany, 109 tons; Holland, 420 tons; France, 3137 tons; Spain, 4980 tons; Italy, 2319 tons; Switzerland, 2133 tons; and the Roman States, 1050 tons. The deliveries of iron in bars present also a decided augmentation this year, having risen from 5397 tons in the first four months of 1862 to 10,175 tons in the first four months of 1863, half going to France. Plates have remained about stationary, 2555 tons having been exported in 1863, against 2556 tons in 1862. Minerals have given rise to important transactions, and follow a decided upward movement, the deliveries having risen to 76,746 tons during the first four months of 1863, against 66,858 tons in the first four months of 1862, and 52,207 tons in the first four months of 1861. Of the 76,746 tons of Belgian minerals exported during the first third of the current year, France alone took 69,057 tons, the rest going to Germany and England. The exports of coal and coke from Belgium during the first four months of 1863 remained at about the same total as in the corresponding periods of 1862 and 1861, having been 1,039,670 tons this year, against 1,009,039 tons in 1862, and 1,049.978 tons in 1861. In France the St. Dizier market remains in the sluggish state by which it has for some time been distinguished. The price of pig has not varied, but transactions are far from numerous, being confined to strictly immediate wants; at the same time, prices preserve their stability, it may even be said firmness, and there is no appearance of a fall. The local trade has now entered on the dead season of summer, but it is hoped that during the next few months the calm will be less marked than in former years, in consequence of the small purchases which have been made since the commencement of 1863. Rolled irons from wood-produced pig have been quoted at 9*l*. to 9*l*. 4s., some lots even making 9*l*. 8s. per ton, with a scale of from 4s. to 8s. per ton between the classes. Mixed irons are quoted 8*l*. 12s. per ton, with a scale of 8s. per class. The production of beaten irons is generally reduced during the low waters of the summer, a circumstance which often involves a "majoration" in prices; fearing a dry summer, some merchants have concluded some tolerably important orders, and the present rates are 10*l*. 8s. to 10*l*. 12s. per ton, this last quotation being the rate most generally current. Axles 16s. per ton in addition. The administration of the Almelo and Salzbergen Railway invites tenders for the delivery of about 5000 rails; offers will be received up to Aug. 1. The Haute-Loire Collieries Company is now paying a dividend at the rate of 8s. per share. The Campagnac Mining Company is also paying a dividend of 12s. 6d. per share in respect to the fourth quarter of 1862; and the Santander Mines and Foundries Company (a Spanish enterprise) is dividing 9s. per share. Reference was made last week in general terms to the position of the Marseilles Gas Lighting, Blast-Furnaces, and Foundries Company, and it may now be added that the balance of profit in respect to the exercise of 1862 amounted to 32,580*l*. The dividend for 1862 was fixed at 16s. per share, of which 10s. per share has been already paid, and the remaining 6s. per share will be divided on Oct. 1. This absorbed 32,529*l*., a reliquat of 51*l*. being carried forward to the profit and loss account of 1863. The purchase of a parcel of land required for the extension of the Marseilles Gas Works, and to cost 3600*l*., was approved at the annual meeting of the shareholders; and the same course was adopted with regard to two parcels of land, to cost 2600*l*., and required for the working of the Portes Collieries. The council of administration was authorised to make the best possible terms with the Paris, Lyons, and Mediterranean Railway Company for the construction of a branch to unite the Portes Colliery with the Alais and Brioude line, and the cession, in whole or in part, to the monster company of the railway existing between the Levade station and the Place des Luminières.

The market for copper at Paris has regained some animation, in consequence of the favourable advices from England. Thus English has made 90*l*. to 95*l*.; Lake Superior, 103*l*. to 104*l*.; and Chilian, 89*l*. At Havre some rather important transactions have been concluded in copper from the southern seas, comprising 262 tons of Chilian (as well immediately disposable as to be delivered), at 86*l*. to 88*l*. per ton; another lot of 35 tons of Chilian, in bars, at 88*l*.; and a lot of 12½ tons, at 88*l*. 8s. per ton. Little change has been noted at Marseilles, the previously quoted rates being very firmly sustained. At Hamburg it is expected that the rise which has recently taken place in prices in England will exert a favourable influence upon the general tone of that market, and an early rise is anticipated on the part of founders. Cologne has been very firm at preceding rates. With respect to tin, the public sale just held by the Dutch Society of Commerce, at Amsterdam, has been this year distinguished by very high rates. The whole of the 119,092 ingots offered found purchasers at 76 fl.; this price was a little below the estimates which had been formed, but it was considerably above the rates of last year, when sales were effected at an average of 67¾ fl. Since the sale the article has been a good deal sought after at Amsterdam and Rotterdam, and runs off at 76½ fl. to 77 fl. At Paris Banca has been firm at 136*l*., Detroit at 134*l*., and English at 124*l*. Previous rates have been maintained at Hamburg; Berlin has been quiet, and without change; and at Cologne, Banca, which has been very firm, is still going up. There is little change to notice in lead, nevertheless in consequence of the good tone pervading the metal markets generally, this article has recovered a little firmness, and has been tending slightly upwards. In soft German little has been done at Hamburg, and prices are considered nominal; other sorts, however, are firmer. Cologne has been firm, and soft refined lead has especially been in good demand at this point. Affairs have been without importance at Paris, but still rates are maintained, rough French making 22*l*., and Spanish 22*l*. 4s. per ton. No improvement can be noted in tin, which has been so long in a languishing state. At Paris the article is little sought after, rough Silesian making 18*l*. 12s., and rolled 22*l*. to 23*l*. 16s. per ton. At Cologne rough zinc, which has been long neglected, has been in better demand. The Breslau and Hamburg markets have remained heavy, and scarcely any transactions have taken place.

For many years attention has been devoted to improvements in blast-furnaces, and the ameliorations effected have referred principally to the quantity of pig produced daily. The progress effected under this head has been rapid, but hitherto the changes introduced have been restricted to the dimensions of furnaces, or to certain portions of their constituent parts, no one daring to modify the essential principles of construction. The Russian Major-General Woldemar-Raschette has not hesitated, however, to confront this aspect of the question, and has introduced what he styles a "normal and universal" furnace on the estates of Prince Demidoff, in Russia. The results obtained are stated to have been so favourable that similar furnaces have been undertaken at Mulheim, in Prussia. We may possibly give some further details shortly with respect to the Russian general's proceedings.

We proceed to afford some particulars as to the lead and silver bearings of the department of the Ariége, in France, in continuation of the data already supplied on the copper wealth of the district. The lead mines of Argentère and La Quorre are situated in the Valley of Aulus, about nine miles and a half above the commune of that name. The Argentère Mine is indicated by old excavations and by the appearance on the surface of the soil of a mass of minerals, composed of quartz, mica, calcaire, and fluor-spath, in which may be observed galena and blende. The Quorre Mine, which is rather more than a quarter of a mile to the west of the preceding one, appears to have much more importance. Several veins exist, and the principal one, which is enclosed in a micaceous quartz schist, is continued regularly from the east to the west for a great length. The mineral is composed of argentiferous galena and carbonated lead. At the end of the sixteenth century the recollection was preserved in the district of rich workings which had existed in it. The Castel-Minier Mine is situated, like the former, in the Valley of Aulus, at a distance of three miles above the village, near the ruins of very considerable buildings, in which the fusion of minerals was effected, and which have preserved the name of Castel-Minier. Extremely extended excavations are observed, indicating a very important working. According to the tradition of the country these mines were worked by the Romans, and were in activity in the twelfth century, when the workings were probably ruined by an invasion of Catalans. This tradition is confirmed by the discovery made at various times of ingots of lead and silver, hidden in the remains of the old establishments. Thus, about 1580, a peasant of Aulus found in the refuse of the foundry an ingot of silver weighing more than 10 lbs. A badly conducted attempt was made, about 1775, to resume the works; it appears that the nature of the principal mineral, which is argentiferous carbonated lead, was misunderstood. This bearing seems yet to contain great mineral wealth. The Sentein Mine, situated in the mountains of Gabère, in the commune of Sentein, in the canton of Castillon, is about a six hours' walking journey from Sentein, and contains metalliferous beds, intercalated in transition earth, composed at this point of clayey, silicious, and calcareous schists. The extremity of the principal bed has been followed for a distance of some miles. The mineral, which is composed of galena and blende, is found disseminated in beds and small veins, the power and direction of which are very variable. Frequently the small scattered veins unite and form heaps of considerable richness. This bearing, discovered in 1844, was in 1845 the object of sustained works, which have given fortunate results. The Larque du Buis Mine, in the valley of Confians-de-Salau, has a vein of a thickness of from 6 to 8 in., containing galena in heaps, with a gangue of hydrated iron and carbonated lime. This mine was worked in old times for lead and silver, probably at the same time as the other bearings, situated in the same territory. In the fields of this commune fragments of litharge have frequently been found. The Mongolin Mine is situated in the commune of Saleix, in the canton of Vic-Dessos. According to an analysis made by Monnet in 1777, the mineral produced by exploratory works prosecuted at that period returned 0·60 per cent. of lead, and 0·0006 per cent. of silver. The Mimort Mine is in the commune of Seix, 3¾ miles from that village, and to the west of Confians-de-Bemmajou, in the valley of the Salat. The bearing is composed of a very fine vein, 80 in. in thickness, directed from the north-north-east to the south-south-west, prolonged to the south-south-east with an inconsiderable fall; it is enclosed in a rock of argillaceous schist. This bearing, with regard to which exploratory works have been undertaken at various periods, and especially towards the middle of the last century, has furnished in abundance argentiferous galena, with a gangue of carbonated lime, and a certain quantity of copper pyrites. The bearing presents all the chances of a fruitful working, and it is affirmed that the inexperience of the last speculators alone led to the abandonment of the mine and foundry established near Seix in 1756. This locality, or rather the village of Oust, situated a little below Seix, is naturally indicated as the site of a central foundry, which will be built one day for the treatment of the lead, copper, zinc, and silver minerals furnished by the numerous metalliferous valleys, the waters of which unite at this point. The Souquette Mine is situated on the left bank of the Souquette rivulet, in the commune of Augirain. The mineral is composed of galena, carbonated lead, blende, and pyrites, and the fragments obtained yield on being tested 0·28 per cent. of lead and 0·0024 per cent. of auriferous silver. The mine, on which exploratory works were made in the sixteenth century, has furnished very fine minerals; the works previously undertaken were abandoned from a want of the necessary capital, but their resumption offers many chances of success. Indications of argentiferous galena exist at various points of the department, too numerous to mention.

AUSTRALIAN MINES.

KAPUNDA.—The operations were all proceeding satisfactorily. The quantity of ore raised in Feb. was 210 tons, of 15 per cent. average produce=31¾ tons of pure copper. And the quantity raised in March is estimated at 280 tons, of which the samples were not all settled, but the average produce will be higher than the previous month. The smelting furnaces were in full operation, but in consequence of scarcity of freight, no shipments are advised by this mail beyond 20 tons forwarded to port for transhipment to London *via* Melbourne, leaving about 60 tons, which it was expected would be shipped in about three weeks from date.

YUDANAMUTANA COPPER.—Yudanamutana Mine: We have holed the level from the engine-shaft to No. 1 winze; the lode here is 3 ft. wide, of gossan, iron, and copper, but not rich. We are now driving the same level south from the engine-shaft, and north from No. 1 winze; in the former place it is disordered by the cross lode passing through section 1397, and in this place is producing some good ore. Mary's shaft is about 5 fathoms from surface; from it, and a stope taken from its south end, we have raised during the last month a fine pile of ore of fully 40 per cent. The big bunch on the top of the hill is still yielding a large quantity of rich ore. Since Capt. James has been here to superintend the ore dressing, up to the end of four weeks he has dressed over 50 tons of ore of 40 per cent. from this section. There are also about 100 tons of ore undressed on this section.—Wheal Gleeson: Henry's shaft is down to the 10 fm. level; this level is down 6 to 8 fathoms in a "bunchy," but paying, lode. The level under No. 1 level is laying open some good ore ground. No. 1 level has been comparatively poor during the month.—Martichudana Mine: Lumley's shaft is still opening a good lode.—Section 1397: The cross lode holds rich, and promises to be something good.—Wheal Blinman: Martin's shaft is holed to the level, south of Jane's shaft, and has laid open that level for taking away ore. The holing of this shaft has placed us in a very good position, as it will supply us largely with cartable ore during the winter season. We are now breaking 5 tons of ore per day, by six men, from the back of this level, and shall be able to load as many drays as may come. The stope on top of the hill has produced all the ore we have sent down during the last three months, and is still producing a large quantity. I got the third-class ores lying on this mine assayed, and the result is very pleasing—the lowest quality, a pile of smalls, is 12 per cent., and the highest, a pile of thirds, is 23 per cent., and five other piles are—viz., 12½, 13, 15, 16¼, and 22½ per cent., making about 600 tons of third-class ores, of an average of about 16 per cent. There are also about 1000 tons that will pay for dressing and smelting. At present we are raising more ores than at any time since I have had charge. I will let you known at the end of the month the quantity of ore on surface over the quantity sent to port.

GREAT NORTHERN COPPER.—The 20 fm. level is in 7 fms., without any change for the better, still carrying a bold end of barytes, without ore. The stopes, I am sorry to say, also continue so poor that I find it will not pay for beating away, and I am now very much afraid that very little ore ground will be found in the present 20 fm. level, excepting a rise that I intend taking from the back of the 15 fm. level to the bottom of the 10 fm. level going west, which will give us all that course of black ore that was out while stoping the bottom of the 10 fm. level for water-way. In the main cross-cut through the hill we have at last cut through the footwall of the lode, exposing but a branch of ore some 7 or 8 in. in thickness, composed of green carbonate and yellow ore, but much pinched, and I am very much afraid, from present appearances, that our prospects are not very bright in that quarter, unless a different change of ground is met with. The amount of ore for this month, I am sorry to say, is very little, as you will see by the ore account.

NORTH RHINE COPPER.—Captain Barkla has been obliged to suspend the sinking of No. 2 winze, on account of the water, and had put the men to sink a shaft on the eastern lode, to prove the piece of ground now lying south of No. 1 shaft. This is now down 9 fms. from surface, the lode at present being about 12 inches wide, containing quartz, with stains of copper. There is nothing fresh to report in the 60 fathom level, which is now driven 63 fms. south of Cope's engine-shaft, and 17 fms. south of No. 1 winze. We enclose bill of lading of a box of samples taken from various parts of the lode, and shipped per *Oscar*.

WORTHING.—The plat in the 53 fm. level at Legg's engine-shaft is almost completed, and we shall commence to drive in a few days. I am very much pleased to be able to say with confidence that the lode has greatly improved in cutting the plat, and that the ore raised has a great deal more than paid for cutting it. The lode we have to commences driving on in the 53 south is from 6 to 7 ft. wide, and will yield from 5 to 6 tons of ore to the fm.; ground easy, water coming away very fast, which indicates a loose lode ahead; north, the lode is not quite so good. The ore raised is of the same rich quality as the stones sent. I am of opinion that at this level large deposits of ore will be met with. In the 43 south not much has been done the past month, owing to our driving too far west on a flookan; we have now discovered that the lode hove itself to the east, and have commenced cutting into it. It appears to be of immense size; we are already into it about 10 ft., a good paying lode all through, and no sign of the eastern wall. This is a decided improvement since my last month's report. Owing to a horse of ground dipping north, two of the winzes in the 33 are not quite so good, when through this bar of poor ground we shall take the next shoot of ore, which is not far to the south. In No. 2 winze, 10 fms. south of the above, the lode is 4 to 5 ft. wide, and will yield 4 tons to the fm. We have recommenced driving the 33 south of Lean's shaft. We have 12 men stoping, but the greater part of the ore has been raised from cutting the plat, sinking the winzes, &c., from the 43 end. Ore dressed and sent to furnace 180 tons, of rather richer quality than the average of months gone by. Machinery and dressing going on well; 34 tons of rough copper have been made during the past month; 28 tons have been shipped, and we have now on hand about 16 tons copper, and (say) 360 tons of ore of the usual average. The number of hands employed about the same. The wood carters were rather backward during the first part of the month, but are now coming in pretty regular. I know not what more to say, than that our prospects are looking upward.

ENGLISH AND AUSTRALIAN COPPER.—The quantity of coal at the Port works and alongside was 2483 tons; at Koorings, 570 tons of coal and 4020 of wood; and at Kapunda and on the road, 1056 tons of coal. There were three furnaces and one refinery at work at Kooringa, and four furnaces and one refinery at work at the Port works: 40 tons of copper had been shipped to India.

METALLIC ALLOY.—Mr. A. L. Woolf, of Birmingham, proposes the use of an alloy as a substitute for gold, consisting of copper from 90 to 100 parts; aluminium, 5 to 7½ parts; and gold, 2½ parts. The alloy formed is described as very closely resembling fine gold.

NEW PATENT SELF-ACTING RAILWAY BRAKE.—A brake of this description, for some time past attached to a carriage upon the North British line, has been tried upon the Tynemouth branch of the North-Eastern, in the presence of a number of officials, and gave great satisfaction to all parties interested, so much so that a gentleman of high engineering repute pronounced it all but perfection. This, we believe, is the thing which has been so long wanted, its simplicity of construction, immense power, instantaneous and imperceptible effect in stopping the train in the short space of a few yards, no matter what speed it may be running at, the passengers feeling no inconvenience whatever, and being entirely under the control of the engine driver, no signalling to the guard is required. To see danger is to avoid it. With this brake in use, the public as well as the railway proprietors may almost reckon upon complete exemption from those destructive and frightful calamities which so frequently take place for want of brake power. In addition to the above recommendations, its trifling cost will be greatly in favour of its adoption. It is brought out by Mr. Thos. Gibson, watchmaker, Berwick-upon-Tweed, who, in conjunction with Mr. Thomas Hall, Collingwood-terrace, and Mr. Thomas Davison, Hall-terrace, have taken out a patent for it.—*Gateshead Observer*.

BARCLAY'S PATENT STEAM AND WATER PRESSURE AND VACUUM GAUGES.

These GAUGES are MADE to INDICATE ANY PRESSURE from ONE to TWENTY THOUSAND POUNDS upon the SQUARE INCH.

EACH GAUGE is GUARANTEED FOR FIVE YEARS.

PATENTEE AND MAKER,
ANDREW BARCLAY,
ENGINEER,
KILMARNOCK. 159

PUBLIC TEST OF WIRE-ROPE.—

The SUPERIOR QUALITY of GARNOCK, BIBBY, AND CO.'S WIRE-ROPE was FULLY PROVED by a RIVAL MANUFACTURER at the LIVERPOOL PUBLIC TESTING MACHINE, on the 29th of October, 1860, on which occasion GARNOCK, BIBBY, and Co.'s ropes were found to be the STRONGEST of all the TWELVE SAMPLES from different makers then tested, as reported in the papers of the day. For example:—

(Certified by Mr. William Macdonald, superintendent.)

Sizes.	Garnock, Bibby, and Co. Tons c.	Corresponding sizes from other manufacturers. Tons c.	Tons c.
3½ in.	18 5*	16 10	11 10
2¾ in.	8 15*	7 15	5 9

Remaining sizes with similar results.

* Samples taken promiscuously from stock by a rival manufacturer's agent.

GARNOCK, BIBBY, AND CO.,
SWAN HEMP AND WIRE ROPE MANUFACTURERS,
LIVERPOOL.

FLAT and ROUND STEEL and IRON WIRE ROPES for MINES, &c., of SUPERIOR QUALITY. 160

MESSRS. KNOWLES AND BUXTON, CHESTERFIELD,

MANUFACTURERS OF PATENT TUBULAR TUYERES.

The PATENT TUBULAR TUYERE possesses GREAT ADVANTAGES over the ORDINARY TUYERES, both for its DURABILITY and EASY WORKING. A current of cold water going direct to the nozzle prevents their destruction, however much they may be exposed to the fire.

We repair them at half the first cost, making them equal in size to new ones, all parties returning them carriage paid.

No. 1 tuyere,	16 in.	long	28s. each.
No. 2	18		32s.
No. 3	20		36s.
No. 4	22		40s.
No. 5	24		44s.

Delivered at Chesterfield station. Terms, nett cash quarterly. 161

THOMAS TURTON AND SONS,

MANUFACTURERS OF

CAST STEEL for PUNCHES, TAPS, and DIES, TURNING TOOLS, CHISELS, &c.
CAST STEEL PISTON RODS, CRANK PINS, CONNECTING RODS, STRAIGHT and CRANK AXLES, SHAFTS, and
FORGINGS of EVERY DESCRIPTION.

DOUBLE SHEAR STEEL,	FILES MARKED
BLISTER STEEL,	T. TURTON.
SPRING STEEL,	EDGE TOOLS MARKED
GERMAN STEEL.	WM. GREAVES & SON.

Locomotive Engine, Railway Carriage and Wagon Springs and Buffers.

Illustrated Catalogue, with Prices, forwarded on receipt of 12 stamps.

SHEAF WORKS AND SPRING WORKS, SHEFFIELD. 162

LONDON OFFICE: 17, KING WILLIAM STREET, CITY.

Prize Medals—International Exhibition, Class 1 and 2.

PATENT PLUMBAGO CRUCIBLES.—

The CRUCIBLES manufactured by the PATENT PLUMBAGO CRUCIBLE COMPANY are the ONLY KIND for which a MEDAL has been AWARDED, and are now used exclusively by the English, Australian, and Indian Mints; the French, Russian, and other Continental Mints; the Royal Arsenals of Woolwich, Brest, and Toulon, &c.; and have been adopted by most of the large ENGINEERS, BRASSFOUNDERS, and REFINERS in this country and abroad. The GREAT SUPERIORITY of these melting pots consists in their capability of melting on an average 40 pourings of the most difficult metals, and a still greater number of those of an ordinary character, some of them having actually reached the EXTRAORDINARY NUMBER of 96 meltings. They are unaffected by change of temperature, never crack, and become heated much more rapidly than any other crucibles. In consequence of their great durability, the saving of waste is also very considerable.

The company have recently introduced CRUCIBLES SPECIALLY ADAPTED for the following purposes, viz.:—MALLEABLE IRON MELTING, the average working of which has proved to be about seven days; STEEL MELTING, which are found to save nearly 1½ ton of fuel to every ton of steel fused; and for ZINC MELTING, lasting much longer than the ordinary iron pots, and saving the great loss which arises from mixture with iron.

For lists, testimonials, &c., apply to the Patent Plumbago Crucible Company, Battersea Works, London, S.W.

Fully described in the MINING JOURNAL of July 5. 163

BASTIER'S PATENT CHAIN PUMP.

APPARATUS FOR RAISING WATER ECONOMICALLY, ESPECIALLY APPLICABLE TO ALL KINDS OF MINES, DRAINAGE, WELLS, MARINE, FIRE, &c.

J. U. BASTIER begs to call the attention of proprietors of mines, engineers, architects armers, and the public in general, to his new pump, the cheapest and most efficient ever introduced to public notice. The principle of this new pump is simple and effective, and its action is so arranged that accidental breakage is impossible. It occupies less space than any other kind of pump in use, does not interfere with the working of the shafts, and unites lightness with a degree of durability almost imperishable. By means of this hydraulic machine water can be raised economically from wells of any depth; it can be worked either by steam-engine or any other motive power, by quick or slow motion. The following statement presents some of the results obtained by this hydraulic machine, as daily demonstrated by use:—

1.—It utilises from 90 to 92 per cent. of the motive power.
2.—Its price and expense of installation is 75 per cent. less than the usual pumps employed for mining purposes.
3.—It occupies a very small space.
4.—It raises water from any depth with the same facility and economy.
5.—It raises with the water, and without the slightest injury to the apparatus, sand mud, wood, stone, and every object of a smaller diameter than its tube.
6.—It is easily removed, and requires no cleaning or attention.

A mining pump can be seen daily at work, at Wheal Concord Mine, South Sydenham Devon, near Tavistock; and a shipping pump at Woodside Graving Dock Company (Limited), Birkenhead, near Liverpool.

J. U. BASTIER, sole manufacturer, will CONTRACT to ERECT his PATENT PUMP at HIS OWN EXPENSE, and will GUARANTEE IT FOR ONE YEAR, or will GRANT LICENSES to manufacturers, mining proprietors, and others, for the USE of his INVENTION.

OFFICES, 63, DEAN STREET, SOHO SQUARE.
London, March 21, 1859. Hours from Ten till Four. J. U. BASTIER, C.E. 164

TO CAPITALISTS.—MESSRS. LEICESTER AND CO.,

INSPECTORS and VALUERS of MINES, &c., MELBOURNE, VICTORIA, OFFER THEIR SERVICES to SELECT and INVEST CAPITAL in MINING PROPERTIES, for which they charge 2½ per cent.; and they also COLLECT and TRANSMIT the DIVIDENDS, charging £5 per cent. on their amount. Messrs. LEICESTER and Co. earnestly call the attention of capitalists to the many opportunities they possess of investing, to pay from £50 to £150 per cent. per annum. Sums under £50 will be charged extra. All remittances must be made through our agent, Mr. RICHARD MIDDLETON, *Mining Journal* office, 26, Fleet-street, London; or direct through our bankers, the Union Bank of Australia. 167

THE BUILDING NEWS.—

An Illustrated Journal, price 4d., devoted to Architecture, Civil Engineering, the Arts of Design and Building. It contains original and practical Essays on Fine Art and on the Principles and Practices of Construction, Notices of New Buildings in all parts of the kingdom, Reports of Architectural and Scientific Societies, Notes on Church Decorations, Memorials and Stained Glass; Sanitary, Gas, Water, and other intelligence; Improved Dwellings for the Working Classes; Lists of Tenders received, and of Competitions and Contracts open; suggestions (oftentimes illustrated) on subjects specially interesting to Architects, Builders, Contractors, and their Employes; correct weekly lists of all new patented inventions connected with every branch of the building trade, and a variety of interesting miscellaneous matter.

London: 26, Bouverie-street, Fleet-street, E.C. 166

THE NEWCASTLE CHRONICLE AND NORTHERN COUNTIES ADVERTISER. (ESTABLISHED 1764).

Published every Saturday, price 2d., or quarterly 2s. 2d.

THE DAILY CHRONICLE AND NORTHERN COUNTIES ADVERTISER.
Published every morning, price 1d.

The best medium for mining, manufacturing, shipping, and trading advertisements in the North of England.

Offices, 42, Grey-street, Newcastle-upon-Tyne; 50, Howard-street, North Shields; 195, High-street, Sunderland. 167

Now ready, Second Edition, demy 8vo., cloth, illustrated by sixteen plates, price 14s. (forwarded free by the author on receipt of Post-office order),

RESULTS OF AN EXPERIMENTAL INQUIRY INTO THE TENSILE STRENGTH AND OTHER

PROPERTIES OF VARIOUS KINDS OF WROUGHT IRON AND STEEL.

By DAVID KIRKALDY, 4, Corunna-street, Glasgow.

OPINIONS OF THE PRESS.

The work before us is a most important contribution to the literature of science, and should find a place among the works for every-day consultation in the libraries of all scientific men, and particularly of all in the least degree connected with the manufacture or employment of wrought-iron and steel.—*Mechanics' Magazine*, August 29, 1862.

This is a thoroughly painstaking, able, modest, and elaborate work, and one that makes a very valuable addition to the stock of engineering data.—*Practical Mechanics' Journal*, October 1, 1862.

So diverse, suggestive, and, above all, so trust worthy are the facts brought out by this enquiry, that few engineers, we are convinced, will neglect to make them the subject of early and careful study.—*Engineer*, July 25, 1862.

After the extracts that have been given, it is hardly necessary to say much in commendation of the work. Its author has done signal service to engineering science, and one that will prove indirectly of real benefit to our iron manufacture. Hitherto we have possessed no work on any one mechanical property of wrought-iron to approach the unpretending volume before us in the comprehensiveness and scientific arrangement of its experimental results.—*Civil Engineer and Architects' Journal*, April 1, 1863.

It is a notorious fact that hitherto our knowledge of the tensile power of wrought-iron and steel has been of the crudest and most unsatisfactory character. * * * The book we cordially commend.—*Building News*, September 5, 1862.

The importance of this laborious volume is unquestionable.—*Builder*, Oct. 4, 1862.

The manner in which the work has been done, and the lucid way in which the results are recorded, reflect the highest credit upon the author, and we doubt not that his book will enjoy that large amount of patronage which it so well deserves.—*Mining Journal*, August 16, 1862.

Mr. Kirkaldy here presents us with a vast amount of information, arranged and classified in a very convenient manner for reference. * * * a careful perusal of which we commend to all practical men engaged in the useful employment of steel and iron, and to the scientific world in general.—*Artizan*, August 1, 1862.

The institution could not be too grateful to Mr. Kirkaldy for his labours; for he had collected a mass of facts which were of the highest value in a scientific and practical point of view.—*Proceedings of the Institution of Engineers in Scotland*, Nov. 13, 1862.

London: Hamilton, Adams, and Co.; Simpkin, Marshall, and Co.; C. Griffin and Co.—New York: Scribner and Co.—Toronto: James Campbell.—Calcutta: Rosario and Co.—Melbourne: Geo. Robertson. 17

BY HER MAJESTY'S ROYAL LETTERS PATENT.

GEORGE SPILL & CO.'S IMPROVED MACHINERY BELTING,

WARRANTED NOT AFFECTED BY HEAT, WATER, OR GREASE, AND MADE TO ANY LENGTH IN ONE PIECE.

PRICES PER FOOT RUN.

Inches wide.	1	1½	2	2½	3	3½	4	4½	5	5½	6	7	8	9	10	11	12
No. 1 substance.	0 3	0 4½	0 6	0 7½	0 9	0 10½	1 0	1 1½	1 3	—	—	—	—	—	—	—	—
No. 2 substance.	—	—	—	0 11½	1 1½	1 4	1 6	1 7½	1 9	1 10½	2 0	2 3	2 6	2 9	3 0	—	—
No. 3 substance.	—	—	—	—	1 6	1 7½	1 9	1 10½	2 0	2 3	2 6	3 0	3 6	4 0	4 6	5 0	5 6

These Beltings (unlike the ordinary manufactures) are woven into one solid substance from the best flax yarn, and saturated with a compound to consolidate them, which is not liable to decomposition. They possess extraordinary strength, as the following certificate will verify, which renders them particularly adapted for paper and saw mills, threshing machines, grain elevators, foundries, machine shops, &c.

COPY OF CERTIFICATE, FROM THE PORT OF LONDON CHAIN CABLE PROOF HOUSE.

THIS IS TO CERTIFY, that the tensile strength of Machinery Belting, manufactured by GEO. SPILL AND CO., of HACKNEY WICK, LONDON, as proved by my chain cable testing machine, at Rotherhithe, to be as follows, viz.:—

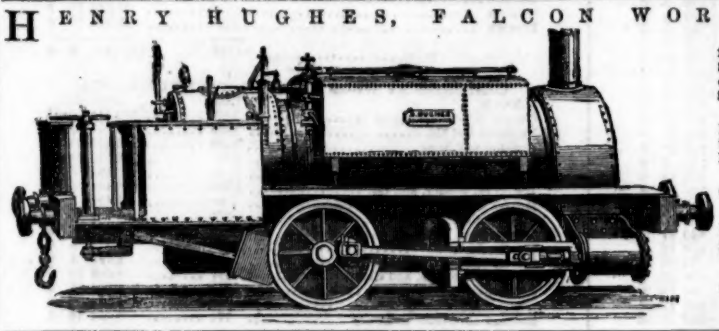
No. 1 substance	5 in. wide, broke at the strain of	6,372 lbs., or, for every inch of width,	1254 lbs.
No. 2.....	5 in. wide,	„ 7,448 lbs., or, for every inch of width,	1489 lbs.
No. 3.....	10 in. wide,	„ 16,663 lbs., or, for every inch of width,	1666½ lbs.
A stout leather band.....	4 in. wide,	„ 2,100 lbs., or, for every inch of width,	525 lbs.

July 9, 1862. (Signed) WM. MITCHESON.

Manufacturers of India rubber. Double texture and oiled waterproof cart, rick, and wagon sheets, made up at price per square yard. Farmers' gaiters, buskins, and farm labourers' waterproof garments.

WORKS, HACKNEY WICK, N.E.;
DEPOT, 149, CHEAPSIDE, E.C., LONDON, AND 9, HIGH STREET, BRISTOL.

HENRY HUGHES, FALCON WORKS, LOUGHBOROUGH.



This LOCOMOTIVE ENGINE has been DESIGNED expressly for CONTRACTORS and MINERAL RAILWAYS. It is VERY STRONG in EVERY PART, and, being mounted on small wheels close together, will MOUNT STEEP GRADIENTS and TURN SHARP CURVES.

The BOILERS are of the BEST PLATES, with fire-boxes of Low Moor, are clothed with hair felt, lagged and covered with sheet iron, and PROVED to a PRESSURE of TWO HUNDRED POUNDS PER SQUARE INCH.

The TYRES are of the BEST YORKSHIRE IRON, and of GREAT THICKNESS. The tank contains 250 gallons.

The FITTINGS consist of BUFFERS, POWERFUL BRAKE, GIFFARD'S INJECTOR, ROSCOE'S OILING APPARATUS, PRESSURE GAUGE, WATER GAUGE, and BLOWER to GET UP STEAM.

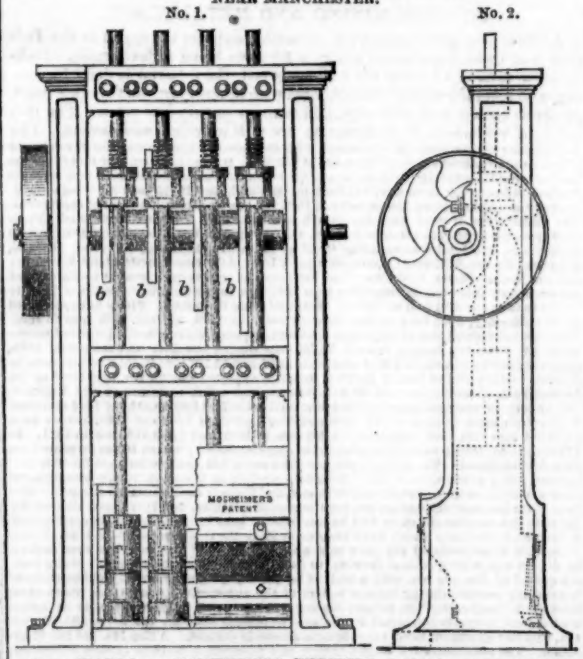
The engines are all tried before leaving the works, and an experienced man sent with them free of cost.

Full specification on application.

10 in. cylinders, 15 in. stroke, price £500. 17

MOSHEIMER'S PATENT STAMPS.

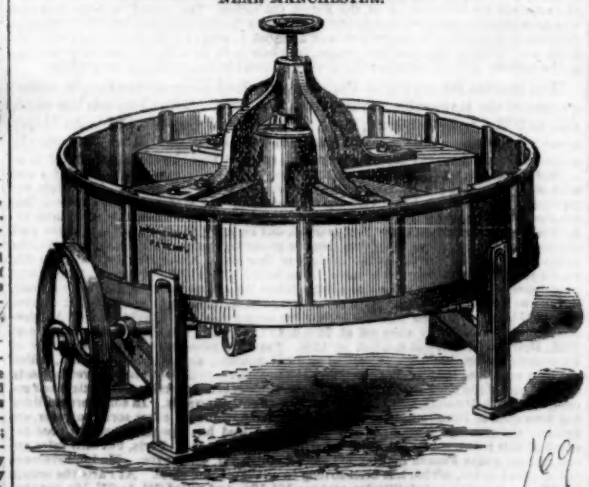
MANUFACTURED BY DUNN AND CO., SALFORD, NEAR MANCHESTER.



These STAMPS are CONSTRUCTED ENTIRELY of IRON, and are ADAPTED for CRUSHING EVERY DESCRIPTION of ORE, MORE ESPECIALLY for REDUCING GOLD ORES, as in consequence of the mortars (coffers) being solid NONE of the PRECIOUS METAL can be LOST. They may be erected on either a stone or wood foundation, are more durable, the wear and tear being much less, and CRUSH TWENTY-FIVE PER CENT. MORE than the ORDINARY STAMPS. Several sets may be seen in the gold district, near Dolgelly.—For particulars, apply to Mr. JOS. MOSHEIMER, Dolgelly, North Wales. 168

MOSHEIMER'S PATENT GOLD AND SILVER AMALGAMATING MACHINES.

MANUFACTURED BY DUNN AND CO., SALFORD, NEAR MANCHESTER.



This AMALGAMATOR is the MOST ECONOMICAL and PERFECT MACHINE in use, and being SIMPLE in CONSTRUCTION, and REQUIRING NO FOUNDATION, it may be put up in a few hours. More gold can be extracted by this amalgamator than by any other, this having been sufficiently proved by the gold extracted from the tailings worked in this machine from the Welsh gold mines. The process is both mechanical and chemical, and the amount of ore worked by each machine is about 1 ton per day.—For particulars, apply to Mr. JOS. MOSHEIMER, Dolgelly, North Wales. 169

TO INVENTORS.—All INTENDING PATENTEES should

PROCURE the PRINTED INFORMATION regarding PATENTS, their COST and the MODE of PROCEDURE to be adopted, ISSUED GRATIS by the GENERAL PATENT COMPANY (LIMITED), 71, FLEET STREET, LONDON.

R. MARSDEN LATHAM, Sec. 170

International Exhibition, 1862—Prize Medal.

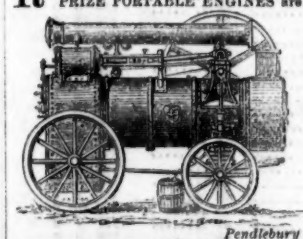
JAMES RUSSELL AND SONS

(the original patentees and first makers of wrought-iron tubes), of the CROWN PATENT TUBE WORKS, WEDNESBURY, STAFFORDSHIRE, have been AWARDED a PRIZE MEDAL for the "good work" displayed in their wrought-iron tubes and fittings.

Warehouse, 81, Upper Ground-street, London, S. 17

Prize Medal, International Exhibition, 1862.

RUSTON, PROCTOR, AND CO.'S CELEBRATED PRIZE PORTABLE ENGINES



are SPECIALLY ADAPTED for WINDING, PUMPING, SAWING, &c. These engines have, in public competition, won the highest honours. For ECONOMY in WORKING, LARGE ALLOWANCE of POWER in CYLINDER AREA and PROPORTIONATE SIZE of BOILER, STRENGTH of CONSTRUCTION, HIGH FINISH, and GENERAL EFFICIENCY, they are unrivalled, having recently been

AWARDED THIRTEEN GOLD, SILVER, and BRONZE PRIZE MEDALS,
And numerous other prizes.

Messrs. A. Knowles and Sons write:—

Pendlebury Colliery, near Manchester, June 5, 1861.

GENTLEMEN,—We beg to inform you tha twe have now in use the portable engine of 8 horse power you supplied us with, and have great pleasure in informing you that it works well, and we are much pleased with the workmanship and finish of it.

We are, yours respectfully, ANDREW KNOWLES AND SONS.

Illustrated, descriptive, and priced catalogues may be had on application to the Sheaf Ironworks, Lincoln.

Works published at the MINING JOURNAL *office*, 26, *Fleet-street, London.*

PRACTICAL TREATISE ON MINE ENGINEERING. By G. C. GREENWELL. In one vol., half-bound, £2 15s.; whole bound in Morocco, £3 10s. In two vols., half-bound, £3 3s.
TREATISE ON IRON METALLURGY. By S. B. ROGERS. £1 5s.
PROGRESS OF MINING FOR 1862. By J. Y. WATSON. 1s.
STATISTICS OF MINING (ANNUAL). By W. H. CUELL. 6d.
"CORNISH NOTES"—NEW SERIES. By J. Y. WATSON, F.G.S. 1s.
BRITAIN'S METAL MINES. By J. R. PIKE. 1s.; by post, 13 stamps.
ORIGIN AND PROGRESS OF MINING IN THE CARADON AND LISKEARD DISTRICTS. By WEBB and GEACH. 1s. 6d.; by post, 1s. 8d.
NEW GUIDE TO THE IRON TRADE, OR MILL MANAGERS' AND STOCK-TAKERS' ASSISTANT. By JAMES ROSE. 8s. 6d.
STOCKTAKERS' ASSISTANT AND OFFICE COMPANION. By J. PARIS. 7s. 6d.
MINING AND SMELTING MAGAZINE. Monthly. 1s.
DUNLOP'S CALCULATOR FOR MULTIPLICATION AND DIVISION. 1s. 6d.
CORNWALL AND DEVON MINING DIRECTORY. 1s. 6d.
BOOK-KEEPING BY DOUBLE ENTRY, EXPRESSLY ADAPTED FOR THE IRON TRADE. By G. J. WILLIAMS. Cloth, 10s. 6d.
HOW TO PREVENT ACCIDENTS IN COLLIERIES. By M. DUNN. 1s.
VENTILATION OF MINES, FOR THE USE OF UNDERGROUND MANAGERS AND OVERMEN. By RALPH MOORE. 5s.
SECTION OF LANARKSHIRE COAL MEASURES (NEW EDITION). By RALPH MOORE. 10s. 6d.
ERRONEOUS COLOURING OF THE MAPS OF THE GOVERNMENT GEOLOGICAL SURVEY OF IRELAND. 1s.
MINERS' MANUAL OF ARITHMETIC AND SURVEYING. By WM. RICKARD 10s. 6d.; by post, 11s.
TRANSACTIONS OF THE NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS. Eleven volumes: 21s. per volume. [Single copies can be had.]
TABLES FOR ASCERTAINING THE VALUE OF TINSTUFF. By Capt. CHARLES THOMAS. 5s.
TAPPING'S HIGH PEAK MINING CUSTOMS. 5s.
TAPPING'S HANDYBOOK ON MERCANTILE, MINING, AND OTHER JOINT STOCK COMPANIES. 2s. 6d.
THE COST-BOOK—TAPPING'S PRIZE ESSAY—WITH NOTES AND APPENDIX. 5s.
TAPPING'S DERBYSHIRE MINING CUSTOMS. 6s.
TAPPING'S COLLIERY AND ORE MINE INSPECTION AND TRUCK ACTS. Cloth, 6s.
TAPPING'S EDITION OF MANLOVE'S CUSTOMS OF THE LEAD MINES OF DERBYSHIRE. 3s.
COST-BOOK SYSTEM—ITS PRINCIPLES AND PRACTICE. 6d.
MINES AND MINING COMPANIES (A Practical Treatise on the Relating to). By WHITTON ARUNDELL. 4s.
MINERS' TABLES. By W. WHITBURN. 4s.
PROPERTIES AND PRICES OF THE METALS CHIEFLY USED IN THE ARTS AND MANUFACTURES. By WM. JOHNSTON. Mounted on rollers, £1 1s.
MINING GLOSSARY—English and Foreign Mining and Smelting Terms. (SECOND EDITION). 2s.
REMARKS ON THE GEOLOGY OF CORNWALL AND DEVON. By Capt. CHAS. THOMAS, of Dolcoath Mine, Cornwall. 1s. 6d.
ON COPPER SMELTING. By HYDE CLARKE, C.E. 1s.
FORM OF "TACK-NOTE." 5s.
COAL MINES INSPECTION ACT. 6d.
VENTILATION OF COAL MINES. 3d.
CLEVELAND IRONSTONE. By JOSEPH BEWICK. Cloth, 21s.; by post, 21s. 8d.
MASTERS AND WORKMEN. By MARK FRYAR. 6d.
INVENTIONS, IMPROVEMENTS, AND PRACTICE, OF A COLLIERY ENGINEER AND GENERAL MANAGER. By BENJAMIN THOMPSON. 6s.
NEW WORK ON GAS, &c. By W. HOPTON. 1s.
MINES OF CORNWALL AND DEVON (Statistics of, and Observations on), by T. SPARGO. 5s.
PROGRESS OF MINING IN 1862: BEING THE NINETEENTH ANNUAL REVIEW. By J. Y. WATSON. 1s.

LONDON: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH, the proprietors), at their office, 26, FLEET-STREET, where all communications are requested to be addressed. [July 11, 1863.